Declining Birth rates in the US: An Analysis of Potential Factors*

Reproduction of 'The Puzzle of Falling US Birth Rates since the Great Recession' (Kearney, Levine & Pardue, 2022)

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Abstract

Over the past 10 years, US birth rates have been dropping steadily to an all time low of 55.8 per 1,000 women in 2020. Kearney, Levine and Pardue (2022) analyzed this phenomenon by exploring demographic, economic, social and policy factors to little avail in enlightenment. However, they did discover a correlation between the decline and the birth cohorts of mothers, and offer the conjecture of shifting priorities as the reasoning. We replicate the results of this study with respect to the demographic and cohort effects, and discuss alternative interpretations of the data considering the impact of the feminist movement and the evolution of technology and media. The results were consistent with the initial study.

1 Introduction

Birth rate is the number of live births per thousand in the population by year (Google dictionary). It is closely related to total fertility rate, which is the number of children that a hypothetical female would have over the course of her reproductive life Statistics Canada. Birth rate is important since it is an indicator of population growth and determines the age structure of populations, which has various implications for the economy and society (Cleland 2008). When the birth rate is too high or low, it affects all subgroups of the population in different ways, for example, a large number of new births will be a burden on the adult population to support them, and when this group ages to be elderly they will be a burden on governments to support them (Cleland 2008).

There are many possible factors that can affect birth rate. Recessions have been proposed to result in a drop in birth rates, specifically the Great Recession of 2007 (Livingston and Cohn 2010; Percheski and Kimbro 2014; Sobotka and Philipov 2011). Becker (1960) proposes an economic framework for fertility, where the "demand for children" is driven by the satisfaction that children brings to people weighted against factors such as preferences (e.g. religion, race, age), income, time, expenditure and means to support each child and other considerations (e.g. contraception, marriage). Kearney, Levine, and Pardue (2022) base their analysis of the declining US birth rates on these factors.

These analyses however, did not provide sufficient evidence to explain the decline in birth rates, with the authors stating "For any factor to have explained much of that decline, it would have had to change dramatically around the same time." (Kearney, Levine, and Pardue 2022). Kearney, Levine, and Pardue (2022) then went on to find a correlation between the recent birth cohorts of mothers and the substantial decline. In our reproduction of their paper, we build on their 'shifting priorities' explanation of the cohort effects by considering the other notable events that potentially may have influenced the nature of parenting of these cohorts, namely the Third wave of Feminism and the second half of the Digital Revolution.

*Code and data are available at: https://github.com/KCtt457/us-birth-rates-decline. A replication of various aspects in this paper are available at:

Table 1: Ten rows of the birth rate data for years 1980-2020

Year	All races	White, non-Hispanic	Black, non-Hispanic	Hispanic	Unmarried	Married
1990	70.9	62.8	89.0	107.7	43.8	93.2
1991	69.3	60.9	87.0	106.9	45.2	89.9
1992	68.4	60.0	84.5	106.1	45.2	89.0
1993	67.0	58.9	81.5	103.3	45.3	86.8
1994	65.9	58.2	77.5	100.7	46.9	83.8
1995	64.6	57.5	72.8	98.8	45.1	83.7
1996	64.1	57.1	70.7	97.5	44.8	83.7
1997	63.6	56.8	70.3	94.2	44.0	84.3
1998	64.3	57.6	70.9	93.2	44.3	85.7
1999	64.4	57.7	69.9	93.0	44.4	86.5

We replicate the paper by Kearney, Levine, and Pardue (2022) with a focus on the following research questions:

- What is the trend in US birth rates over the period 1980-2020?
- How does the trend in birth rates vary with demographic factors such as age, race, education and marital status?
- How do the birth rates vary for different cohorts of mothers by their birth year?

While the original paper used Stata (StataCorp 2021) for data processing and analysis, we use R (R Core Team 2020) for all data wrangling and analysis.

2 Data

2.1 Data Source and Methodology

The data on birth rates per 1,000 women ages 15-44 across all races and demographic population subgroups are obtained from the National Vital Statistics Reports for the years 2015, 2019 and 2020 (Martin and Mathews 2017; Martin and Driscoll 2021; Hamilton and Osterman 2021), which they collected from birth certificates registered in all US states and the District of Colombia. Aggregated data on the number of births for 6 different 5-year cohorts of mothers by their age and birth year is provided by Kearney, Levine, and Pardue (2022), calculated using public birth microdata across the period 1980-1989 from the NBER Natality Database and NCHS microdata from the period 1990-2019 (CDC NCHS 2020, NBER 2021b). The cohorts span the years 1968-1997.

Single-age population counts, among all races from 1969-2019 and by race and Hispanic origin from 1990-2019, is obtained from the CDC SEER database (CDC NCI 2021).

2.2 Attributes

The birth data consists of variables for the year, and birth rates for each population subgroup. For example, for race there are 3 variables: birth rate for whites, birth rate for blacks and birth rate for hispanics. There is birth rate data for 4 population subgroups - age (5-year groupings), race and ethnicity, marital status and mother's level of education. We show a glimpse of the data with variables for race and marital status in table 1.

For the aggregated cohort birth data, the variables are mother's age, birth cohort, number of births and cumulative births. The population data provided by Kearney, Levine, and Pardue (2022) gives the population

Table 2: First ten rows of the birth cohort data for 6 birth cohorts

Cohort #	Birth Years	Mother's age	Number of births	Cumulative births	Population Count
1	1968-1972	15	121158	121158	8978763
1	1968-1972	16	268005	389163	8987457
1	1968-1972	17	461462	850625	9102192
1	1968-1972	18	677810	1528435	9092741
1	1968-1972	19	892714	2421149	9655879
1	1968-1972	20	1004168	3425317	9625147
1	1968-1972	21	1060746	4486063	9454383
1	1968-1972	22	1074214	5560277	9273533
1	1968-1972	23	1054644	6614921	9295797
1	1968-1972	24	1049909	7664830	9542999

count for women by age, year and state. We group the population count by cohort and mother's age and join this to the cohort birth data, with the first 10 rows of this data shown in table 2.

3 Results

3.1 Overall Trend in US Birth Rates

Figure 1 is a replication of Figure 1 in the original paper. Between 1980 and 2007, the birth rates generally remained between 65-70 births per 1,000 women ages 15-44, with a minimum rate of 63.6 in 1997 and a maximum rate of 70.9 in 1990. The grey dashed lines mark the years of past recessions (add citation), where we generally see a pattern of decline followed by an uptick in birth rates. After the Great Recession of 2007 however, there was a steady decline, diving below its past minimum rate from 1997 with a birth rate of 63.2 in 2011, and no resurgence so far. The lowest birth rate on the graph occurs in 2020 with 55.8 births per 1,000 women, which is a steep drop of 2.5 from the previous year.

3.2 Demographic Factors

Figure 2 is a replication of plots A, B, D and E of Figure 2 in the original paper.

Plot A shows the trend in birth rates over the period 1980-2020 by five-year age groups. As one would expect, the oldest age group 40-44 has the lowest birth rate. Of note is that the birth rates for older age groups 30-34, 35-39 and 40-44 have been increasing over the period, whereas the younger age groups 15-19, 20-24, 25-29 have been decreasing. The inflection point of increase/decrease is especially noticeable at the year 2007.

Plot B shows the trend in birth rates over the period 1980-2020 for different races and ethnicities. Non-Hispanic black and white groups show a fairly constant trend in birth rates over the period, whereas the Hispanic group shows a significant drop after the Great Recession.

Plot C shows the trend in birth rates over the period 1980-2020 for married vs unmarried mothers. Besides the small increase for unmarried women between 1980 and 1990, the trends do not demonstrate significant fluctuations in birth rates. The birth rate is higher for married mothers than unmarried mothers.

Plot D shows the trend in birth rates over the period 1980-2020 for different levels of the mothers' education. The birth rates for highschool graduates, college graduates and mothers with some college education is in about the same range after 2007. Mothers with no highschool degree have the highest birthrate of the 4 education groups, and is the only group to show a decrease in this rate after 2007.

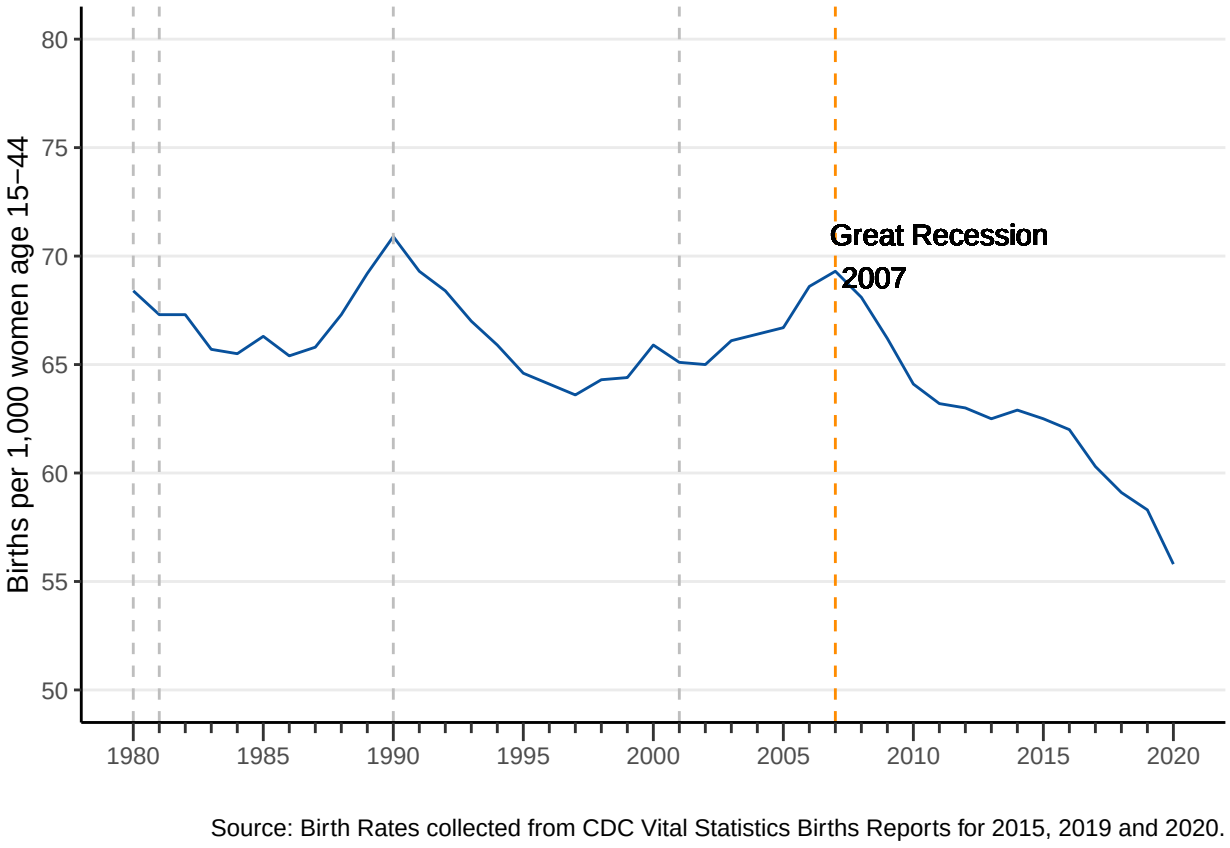

Figure 1: Trend in US Birth Rates

3.3 Cohort effects

Figure 3 is a replication of Figure 5 of the original paper. The cumulative birth rates for the 3 earlier cohorts are more similar to each other than the 3 later cohorts, with the latest cohort showing the lowest number of children ever born.

4 Discussion

4.1 Why is the birth rate declining?

In Figure 1, we saw that the birth rate enters a persistent decline after the Great Recession in 2007. However, one is left to wonder if this recession is really the event to demarcate this trend in birth rates, since it does not mirror the pattern of recessions prior.

To investigate this idea more, we now turn to the trends among the various demographic subgroups. For the different age groups, the decreasing trend among younger age groups and increasing trend among older age groups points to the idea that women are choosing to have children later in life, an attitudinal change. Only the age 20-24 group seems to show a decrease at the 2007 mark that differs significantly from the years prior. One explanation is that it is the age when most people attend university, and more women are applying for tertiary education. In fact, the National Center for Education Statistics (NCES) data shows a

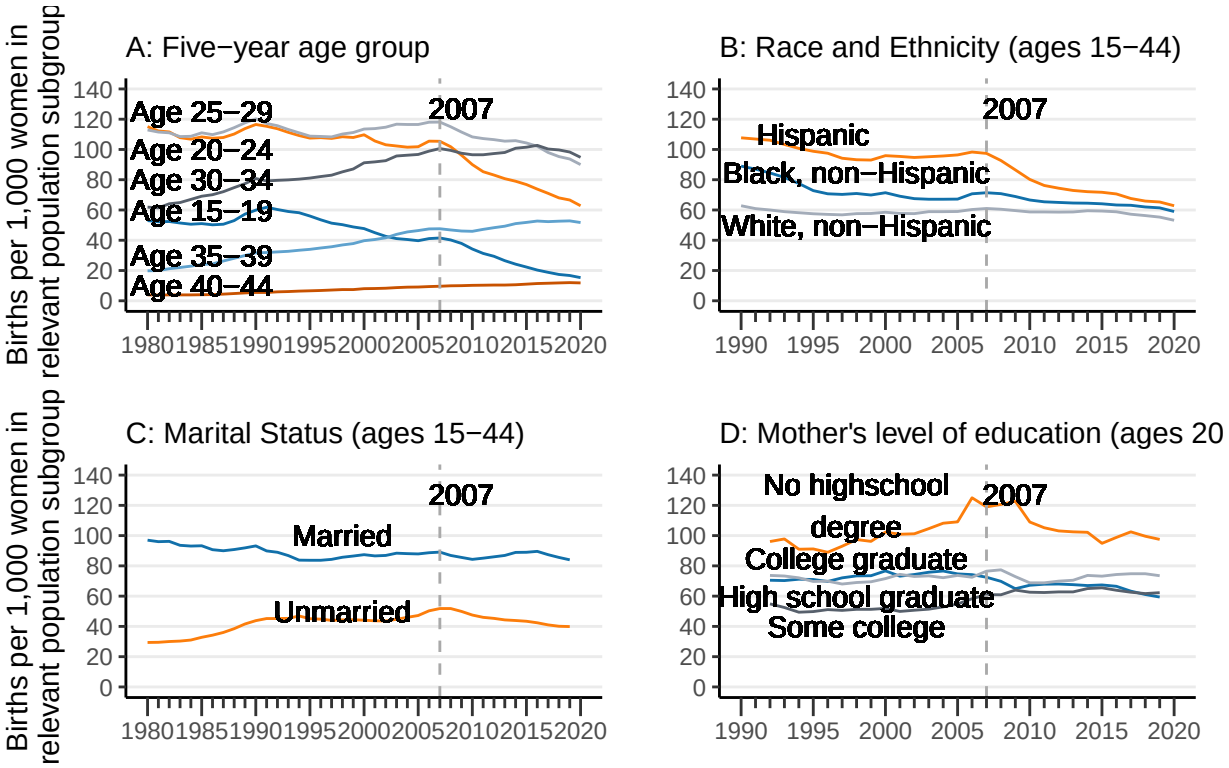

Figure 2: Trends in Birth Rates by Population Subgroup

17.6% increase in undergraduate enrolment among females from 2007 to 2011 (NCES, 2020), which coincides perfectly with the 19.1% decrease in birth rates in the 4 years after the Great Recession began in 2007.

For race and ethnicity, the birth rates for Black and White women remains fairly constant and only the Hispanic women show a significant decline in the years 2007-2011 before it plateaus to follow a similar trend to the other two races. Kearney, Levine, and Pardue (2022) offer assimilation as a possible explanation with evidence from Tavernise 2019, Parrado and Morgan (2008).

For marital status, married and unmarried women have fairly unchanged birth rates around 2007. The small decrease in birth rates for unmarried women

4.2

4.3 Cohort effects - feminism, technological influence, media?

From Figure 3, it was shown that the birth cohorts in years 1968-1982 are quite similar to each other whereas the cohorts born in years 1983-1997 seemed to pull more away with lower birth rates compared to the predecessors. In fact, these two groupings of years define two generations respectively: Generation X and Generation Y, or the "Millenials" (Pew Research Center, 2019). Pew Research Center (2019) conducted a study comparing various lifestyle factors such as education, income, family and housing to its prior generations and there is a stark difference.

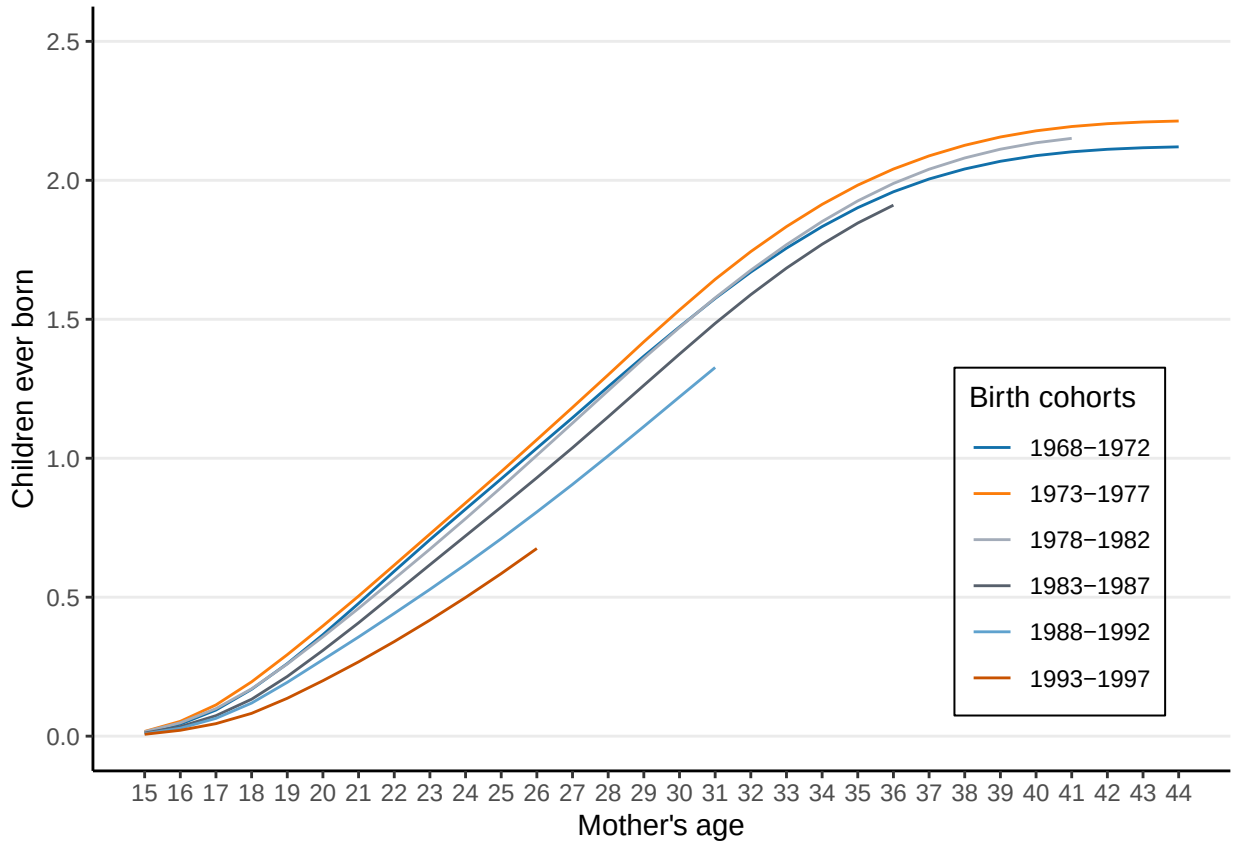

Figure 3: Children Ever Born by Mother's Age and Birth Cohort

4.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

A Additional details

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